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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/696,432	10/29/2003	Ying-Lang Wang	TS01-167CB	6825

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EXAMINER	
DOLAN, JENNIFER M	

ART UNIT	PAPER NUMBER
2813	

DATE MAILED: 12/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/696,432	WANG ET AL.	
	Examiner	Art Unit	
	Jennifer M. Dolan	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 October 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *17,19,21,22,24 and 26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *17,19,21,22,24 and 26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *1/29/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/20/05 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 17, 19, 21, 22, 24, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,358,325 to Andreas in view of U.S. Patent No. 6,468,951 to Grieger et al.

Andreas discloses a surface treatment process comprising: providing a hydrophilic surface (silicon dioxide portions 58; also see column 3, lines 45-55), polishing the surface with a slurry that comprising a suspension of abrasive particles in DI and TMAH (see column 4, lines 35-45; column 9, line 65- column 10, line 8, noting that residual particles from the CMP become suspended in the TMAH solution), whereby the surface is rendered hydrophobic (column 3, lines

45-50; also, the presence of the TMAH would inherently render the silicon oxide surface portions hydrophobic), thereby causing the abrasive particles to be removed when the surface is rinsed in DI water (column 4, lines 43-46). Andreas further teaches that the abrasive particles are silica particles (column 4, lines 43-46), and the hydrophilic surface is silicon oxide (column 3, lines 63-65).

Andreas fails to disclose the concentration of the TMAH in the DI solvent. Andreas further fails to indicate the particle size of the slurry abrasive particles. Regarding claims 22, 24, and 26, Andreas further fails to indicate TBAH as a viable substitution for the TMAH.

Grieger discloses a post-CMP cleaning process for removing adhered silica particles (column 9, lines 45-60) from a surface using a mixture of DI, HF, and TMAH, similar to that taught by Andreas (see Grieger, column 2, lines 24-50). Grieger further teaches appropriate concentrations for the TMAH solution, wherein the volume percent TMAH overlaps the claimed range (see column 2, lines 53-67; figure 1). Grieger further indicates that TBAH is a viable substitution for TMAH (column 6, line 7).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the post-planarization method of Andreas by alternately using TMAH or TBAH, as taught by Grieger, specifying a TMAH or TBAH concentration between 2% and 20%, as further taught by Grieger, and further specifying a particle size of 1-10,000 microns. The rationale is as follows: A person having ordinary skill in the art would have been motivated to look toward Grieger for an appropriate TMAH concentration as well as for viable alternatives to the TMAH, such as TBAH, because both Grieger and Andreas are using substantially similar cleaning solutions of DI, HF, and TMAH (Andreas, column 4, lines 41-43; Grieger, column 2,

lines 53-67) for removing silica particle residues resulting from a CMP operation (see Andreas, column 4, lines 34-40; Grieger, column 9, lines 45-60). Furthermore, Andreas suggests that the pH of the cleaning solution is preferably high (Andreas, column 9, line 65 – column 10, line 7), and Grieger specifically shows that high pH solutions result from increasing the concentration of the TMAH (see Grieger, figure 1 – concentration of at least 2% will result in a high pH cleaning solution). Since Andreas and Grieger are using substantially similar solutions for substantially the same purpose, since Grieger shows a suitable concentration of TMAH for both conforming to the high-pH requirement of Andreas as well as effectively removing the silica particles, and since Grieger suggests that TBAH is an art-recognized equivalent material that may be substituted for the TMAH with the same effect as the TMAH (see Grieger, column 6, lines 1-18) it is well within the purview of a person skilled in the art to select a TMAH or TBAH solution of at least 2% for the cleaning composition of Andreas.

Additionally, a person skilled in the art would have been motivated to select a particle size of 1-10,000 microns for the following reasons: CMP slurries are well known and well established in the art of semiconductor device manufacture. It is expected that an appropriate slurry with an appropriate particle size would be selected to optimize the degree of planarization as well as the material removal rate. Although Andreas fails to specifically teach the particle size, it has been held that "where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (1955). Furthermore, it is noted that the specification of the present application contains no disclosure of either the criticality of the claimed particle size or any unexpected results arising therefrom. Where patentability is said to

be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936(Fed. Circ. 1990).

Response to Arguments

4. Applicant's arguments filed 10/20/05 have been fully considered but they are not persuasive.

The Applicant argues that the combination of Andreas and Grieger would not be reasonable, because Andreas teaches that the brush scrubbing operation is preferably performed in a high-pH solution, whereas Grieger shows that the HF composition changes rapidly from acidic to alkaline.

These arguments are not found persuasive, because Andreas and Grieger are using substantially the same cleaning solution of DI+HF+TMAH (or any TAAH) for the purpose of removing silica particles resulting from a CMP operation, as explained in the rejection supra. It is respectfully pointed out that Grieger does not teach a solution having "alterations in pH" as suggested by the Applicant, but rather, Grieger clearly indicates that low TMAH concentration solutions have a low pH, whereas higher TMAH concentration (exceeding about 2%) solutions have a high pH (see Grieger, figure 1). The Applicant's assertion that Andreas requires a high-pH solution would appear to support a combination of Andreas and Grieger, as set forth in the rejection supra, since solutions with a TMAH concentration exceeding about 2% will have a high pH. Furthermore, it is respectfully pointed out that since the Applicant has not supplied any criticality or unexpected results relating to the TMAH concentration, even if Grieger provided no

disclosure of appropriate compositions for TMAH in a DI+HF+TMAH solution, claim 17 could be rejected under Andreas, alone, based on optimization of the concentration of the TMAH for efficient removal of silica particles under *In re Aller* and *In re Woodruff*.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent No. 6,693,035 to Sachan et al. discloses the inclusion of TMAH in a CMP slurry, wherein the materials used by Sachan are generally hydrophilic materials that inherently must be rendered hydrophobic by the inclusion of the TMAH.

U.S. Patent Publication No. 2004/0020134 to Kim et al. discloses the addition of TMAH to a CMP slurry using very small abrasive particles.

U.S. Patent No. 5,704,987 to Huynh et al. discloses post-CMP cleaning processes wherein the hydrophobic and hydrophilic nature of the substrate is altered during the process.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer M. Dolan whose telephone number is (571) 272-1690. The examiner can normally be reached on Monday-Friday 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl W. Whitehead, Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jennifer M. Dolan
Examiner
Art Unit 2813

jmd

CARL WHITEHEAD, JR.
SUPERVISORY PATENT EXAMINER
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